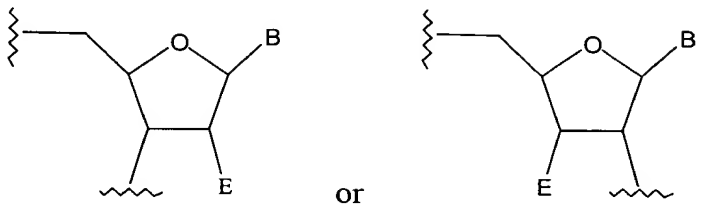
3. (Amended) The compound of claim 1, wherein Q is a nucleoside of the formula:

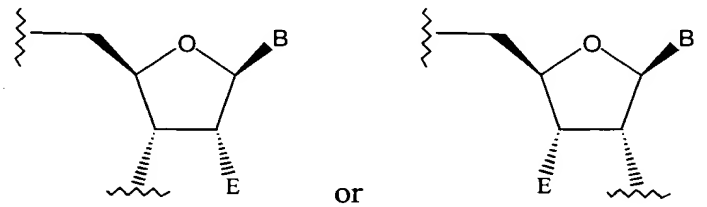


wherein:

B is a labeling group, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or an alkyl; and

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl.

5. (Amended) The compound of claim 1, wherein Q is an oligonucleotide comprising a nucleoside, a nucleoside, or an oligomer comprising a nucleoside, wherein said nucleoside is of the formula:



wherein:

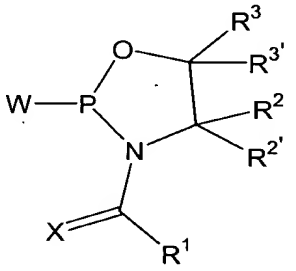
B is a labeling group, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or a C_1-C_6 alkyl; and

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl.

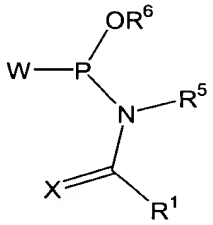
7. (Amended) The compound of claim 1, wherein R^1 is an alkyl, which is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of fluorine, OR^7, and SR^7, wherein R^7 is an alkyl or an aryl.

9. (Amended) The compound of claim 1, wherein R^4 is a 4,4'-dimethoxytrityl group.

10. (Amended) A compound of the formula:



(IA), or



(IIA),

wherein:

W is a leaving group;

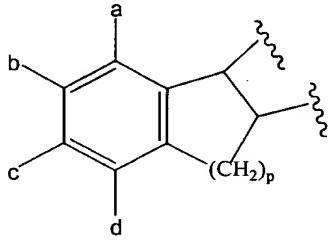
R^1 is an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^1 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of R^7, OR^7, SR^7, NR^8COR^7, NR^8CSR^7, $NR^8CO_2R^7$, $NR^8C(O)SR^7$, $NR^8CS_2R^7$, O_2CR^7, S_2CR^7, $SCOR^7$, $OCSR^7$, SO_2R^7, OSO_2R^7, $NR^8SO_2R^7$, CN, NO_2, N_3, and a halogen, wherein R^7 is an alkyl, an aryl or an aralkyl, wherein R^7 is unsubstituted or substituted with one or more halogen atoms, which are the same or different, and R^8 is H or an alkyl;

R^2 and $R^{2'}$ are the same or different and each is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^2 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of OR^7, CN, NO_2, N_3, and a halogen;

R^3 and $R^{3'}$ are the same or different and each is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^3 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a trialkylsilyl, an aryldialkylsilyl, an alkyldiarylsilyl, CN, NO_2, N_3, a halogen, OR^7,

$P(O)(OR^7)(OR^8)$, COR^9, CSR^9, CO_2R^9, $COSR^9$, $CSOR^9$, $CONR^8R^9$, $CSNR^8R^9$, SO_2R^9, and $SO_2NR^8R^9$, wherein R^9 is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aralkyl, or an aryl, wherein R^9 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of CN, NO_2, N_3, and a halogen; or

R^2 and R^3, $R^{2'}$ and R^3, R^2 and $R^{3'}$, or $R^{2'}$ and $R^{3'}$, together with the carbon atoms to which they are bonded, comprise a cyclic substituent of the formula:



,

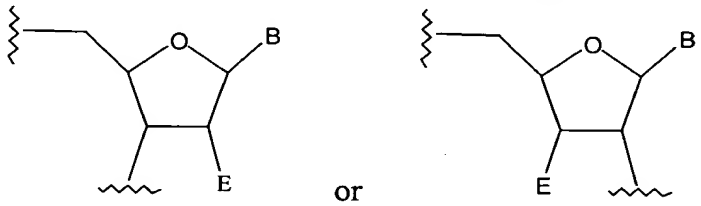
wherein p is an integer from 0-6 and a-d are the same or different and each is selected from the group consisting of H, an alkyl, a nitro, an amino, a hydroxy, a thio, a cyano and a halogen;

R^4 is a protecting group or a solid support;

R^5 is H or an alkyl, which is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of OR^7, CN, NO_2, N_3, and a halogen;

R^6 is a protecting group, an amidoalkyl in which the nitrogen atom thereof is 2, 4, or 5 carbon atoms removed from the oxygen of OR^6, an alkyl, an alkyl ketone, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^6 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of CN, NO_2, N_3, and a halogen;

Q is an a nucleoside, oligonucleotide comprising a nucleoside, or an oligomer comprising a nucleoside, wherein said nucleoside is of the formula:



wherein:

B is a labeling group, an alkyl, an alkenyl an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a

halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or an alkyl; and,

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl; and

X is O, S, or Se.

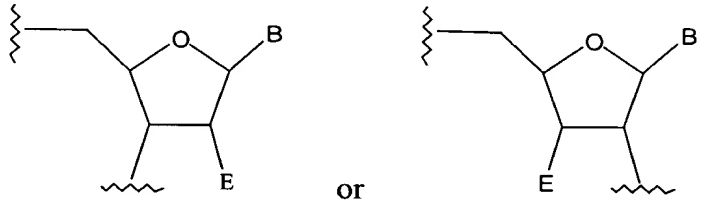
16. (Amended) The method of claim 12, wherein said nucleophile is attached to a solid support.

17. (Amended) The method of claim 12, wherein said nucleophile is of the formula:

$$R^4—O—Q—OH$$

wherein:

Q is a nucleoside, oligonucleotide comprising a nucleoside, or an oligomer comprising a nucleoside, wherein said nucleoside is of the formula:



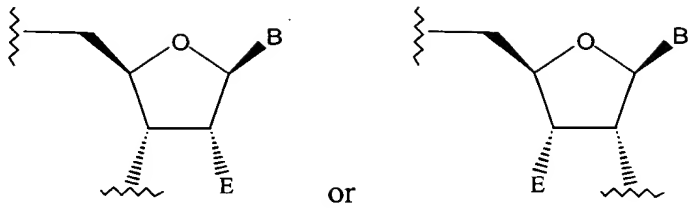
wherein:

B is a labeling group, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or an alkyl; and

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl; and

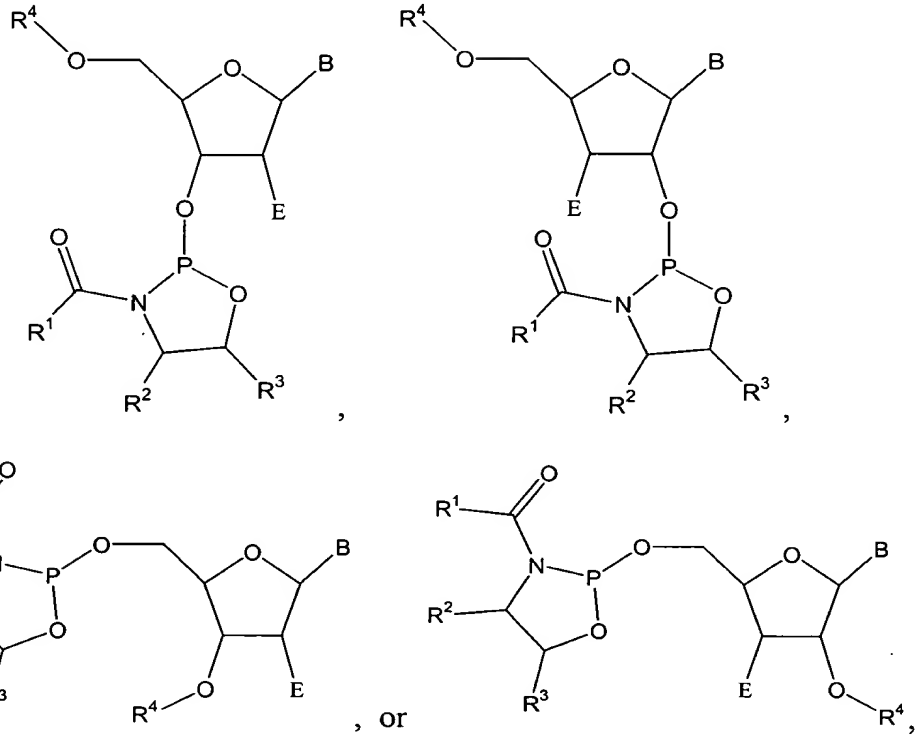
R^4 is a solid support.

19. (Amended) The method of claim 17, wherein Q is a nucleoside, an oligonucleotide comprising a nucleoside, or an oligomer comprising a nucleoside, wherein said nucleoside is of the formula:



wherein B and E are as defined in claim 17.

20. (Amended) The method of claim 12, wherein said N-acylphosphoramidite is of the formula:



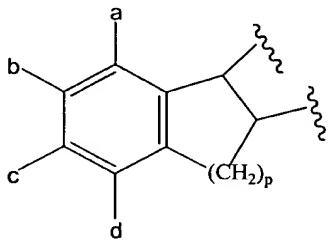
wherein:

R^1 is an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^1 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of R^7, OR^7, SR^7, NR^8COR^7, NR^8CSR^7, $NR^8CO_2R^7$, $NR^8C(O)SR^7$, $NR^8CS_2R^7$, O_2CR^7, S_2CR^7, $SCOR^7$, $OCSR^7$, SO_2R^7, OSO_2R^7, $NR^8SO_2R^7$, CN, NO_2, N_3, and a halogen, wherein R^7 is an alkyl, an aryl or an aralkyl, wherein R^7 is unsubstituted or substituted with one or more halogen atoms, which are the same or different, and R^8 is H or an alkyl;

R^2 is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^2 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of OR^7, CN, NO_2, N_3, and a halogen;

R^3 is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, or an aralkyl, wherein R^3 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a trialkylsilyl, an aryldialkylsilyl, an alkyldiarylsilyl, CN, NO_2, N_3, a halogen, OR^7, $P(O)(OR^7)(OR^8)$, COR^9, CSR^9, CO_2R^9, $COSR^9$, $CSOR^9$, $CONR^8R^9$, $CSNR^8R^9$, SO_2R^9, and $SO_2NR^8R^9$, wherein R^9 is H, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aralkyl, or an aryl, wherein R^9 is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of CN, NO_2, N_3, and a halogen; or

R^2 and R^3, together with the carbon atoms to which they are bonded, comprise a cyclic substituent of the formula:



,

wherein p is an integer from 0-6 and a-d are the same or different and each is selected from the group consisting of H, an alkyl, a nitro, an amino, a hydroxy, a thio, a cyano and a halogen;

R^4 is a protecting group or a solid support;

B is a labeling group, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or an alkyl; and,

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl.

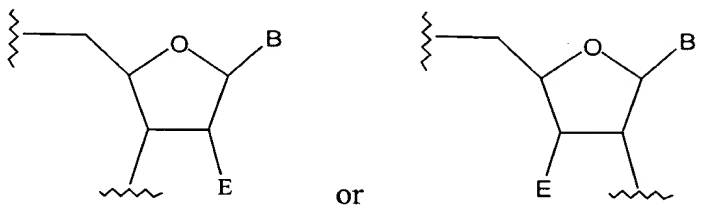
22. (Amended) The method of claim 20, wherein R^1 is an alkyl, which is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of fluorine, OR^7, and SR^7, wherein R^7 is an alkyl, an aryl, or an aralkyl.

23. (Amended) The method of claim 20, wherein R^3 is a vinyl group, a phenyl, or a benzyl.

24. (Amended) The method of claim 20, wherein R^4 is a 4,4'-dimethoxytrityl group.

Add the following claims:

26. (New) The compound of claim 2, wherein each of Q and Q^1 is a nucleoside of the formula:



wherein:

Q and Q^1 are the same or different;

B is a labeling group, an alkyl, an alkenyl, an alkynyl, a cycloalkyl, an aryl, a heteroaryl, a heterocycloalkyl, an aralkyl, an amino, an alkylamino, a dialkylamino, a purine, a pyrimidine, adenine, guanine, cytosine, uracil, or thymine, wherein B is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of a protecting group, R^{11}, OR^{11}, NHR^{11}, $NR^{11}R^{12}$, CN, NO_2, N_3, and a halogen, wherein R^{11} and R^{12} are the same or different and each is H, a protecting group, or an alkyl; and

E is H, a halogen, OR^{13}, NHR^{13}, or $NR^{13}R^{14}$, wherein R^{13} and R^{14} are the same or different and each is H, a protecting group, an alkyl, or an acyl.

27. (New) The compound of claim 2, wherein R^1 is an alkyl, which is unsubstituted or substituted with one or more substituents, which are the same or different, selected from the group consisting of fluorine, OR^7, and SR^7, wherein R^7 is an alkyl or an aryl.

28. (New) The compound of claim 2, wherein R^4 is a 4,4'-dimethoxytrityl group.